A COMPARATIVE STUDY OF SEVEN YOUNG ARCTIANS.

PLATES VII AND VIII.

BY HARRISON G. DYAR, PH. D.

The larvæ of the Arcticans, including in this term both Arctiidæ and Euchromiidæ, are much more highly specialized than those of the Noctuidæ. This specialization tends to force back into the first stage certain characters properly belonging to the later stages, and it is proposed to briefly consider some of the forms which this modification of stage I assumes.

The arrangement of the tubercles in stage I of the Arctians corresponds with that normal for the whole group Bombycides.* The setæ are of the finely spinulated type, with pointed tips, never glandular, in this respect distinguished from the Ptilodontidæ (Notodontidæ) and certain lower Tineid genera, as pointed out by Dr. Packard. The seven species taken to illustrate this paper, represent three unequal groups of the Arctian phylum. From the Arctiidæ proper I have taken *Spilosoma virginica* (Fig. 1), *S. antigone* (Fig. 2) and *Hyphantria cunea* (Fig. 3); from the Phægopterid group, *Halisidota maculata* (Fig. 4) and *H. caryæ* (Fig. 5); from the Euchomiidæ *Cosmosoma auge* (Fig. 6) and *Ctenucha virginica* (Fig. 7). I have arranged these as nearly as possible in ascending order of specialization, and it will be noticed how exactly this corresponds with the arrangement founded on the wing veins of the imago. That is, the *Spilosoma* group represents a more generalized type than the Halisidotas, the latter having reduced secondaries and shortened subcosta, whereas in the Euchromiidæ subcosta is entirely absent. The degree of difference of these groups also is the same in both larva and imago. While the larval Halisidotas are more specialized than the Spilosomas, they do not differ from them enough to determine family characters. The Euchromiidæ, however, do differ to this degree, the special character being the union of setæ ia, ib and iia on thorax to form a single wart. In *Halisidota*

* *I. e.*, the Noctuina as defined by me or Agrotides of Mr. Grote. I find that these names must be replaced by the old term Bombyces or Bombycides, because Bombyx really belongs to this superfamily, and not to the Saturniides, as I formerly supposed, following the conclusions of Professor Comstock. I have recently made a careful examination of stage I of Bombyx, at the suggestion of Mr. Grote, with the above result.

caryæ this process is foreshadowed on the metathorax, but while iia is partly united to i it forms a distinct wart on the mature larva.

This parallelism between the relative advance of larval and imaginal characters is worthy of notice in view of the numerous cases of the reverse tendency.

The details of the seven selected species are shown in the accompanying plate.

Spilosoma virginica.

The setæ are perfectly normal for stage I, all the subprimaries absent. Of the six primary setæ on the cervical shield, four remain on the shield, the others are detached and reduced, so that I detect only one seta on the small detached piece. The setæ of the prespiracular tubercle are also less than in the primitive Tineid stock. On the other thoracic segments, ia and ib are united, iib separate and reduced, all characteristic of the Bombycine type of wart formation. On the abdomen tubercle i is small, the rest large, vii with two setæ on segments 1 and 2, one on 7, 8 and 9, instead of the primitive three setæ; leg plates well marked. Tubercle viii present next the midventral line (not shown in the figure). "Joint 13" is evidently composed of two segments, on the anterior portion (9th abdominal) tubercles i to iii on one large wart, iv and v on another; on the anal plate (10th abdominal) all the five setæ on a single disk.

This is the type from which we start — an Arctian in the primitive first stage.

Spilosoma antigone.

The detached piece of the cervical shield is rudimentary. General tubercles as in *virginica*, except for a peculiar modification whereby tubercle iia on thorax has become three or four-haired (in different individuals) and iii on abdominal segments 1 to 8, four or five-haired; on the ninth abdominal iii seems to be only three haired, as I find but five hairs on the large wart composed of tubercles i to iii. No subprimary setæ; ventral setæ as in *virginica*.

This modification is to be interpreted as a partial wart formation, pushed back into stage I, yet unaccompanied by the subprimary setæ, which in phylogeny must have preceded any wart formation.

Not only in stage I is *S. antigone* unusually specialized for it genus, but in the later stages it has assumed the plumage and habits of *Arctai* (*Eyprepia*), as noticed by Mr. Hulst (Ent. Amer., II, 16). This specialization is not shared by the imago, and is consequently without

effect on the generic location of the species; it is probably the result of comparatively recent adaptation.

Hyphantria cunea.

Tubercles small, normal, two small areas detached from the cervical shield probably represent the two outer primitive setæ. Setæ all single as in *S. virginica*, but on the thorax subprimary seta iii is situated on a small wart behind seta iv and on the abdomen subprimary vi is present on segments 1 to 8, small anteriorly, but of fair size further back.

In this larva there is no precocious wart formation, but the subprimary setæ appear in stage I almost perfectly formed (v is absent on thorax). According to my views, the *Arctiidæ* are descended from the *Noctuidæ*, and here is a case where the specialization of the larva has crowded back into stage I the typical structures of the *Noctuidæ*, the primitive first stage being absent, yet without the supervention of wart formation until stage II.

Halisidota maculata.

As in *S. virginica*, but for a doubling of setæ iii on abdominal segments 1 to 8 and the partial fusion of iv with iii. Subprimary tubercles absent.

Here we have a partial precocious wart formation in the doubled setæ on iii analogous to the condition in *S. antigone* but considerably less developed, not affecting the thorax at all. I regard this species as more specialized than the preceding chiefly on account of the fusion of tubercles iv and iii, a condition found also in some of the Lymantriidæ, a high type in another line of evolution.

Halisidota caryæ.

Tubercle iv unconnected with iii, but iii doubled as in *H. maculata*. On segments 1 to 8 subprimary tubercle vi is present. No subprimaries on thorax, but iia partly fused with i on mesothorax; otherwise normal as in *S. virginica*.

This larva exhibits a partial precocious wart formation and a partial appearance in stage I of the subprimary tubercles. It therefore shows an incompletely developed combination of the characters of *Hyphantria cunea* and *Spilosoma antigone* and is consequently higher than either. It is more advanced than *H. maculata* in the presence of the subprimaries.

Cosmosoma auge.

Tubercles weak; setæ single, normal, no subprimaries. This larva is placed higher than all the preceding on account of the complete

union of tubercles iia and i on the thorax. In other respects there is present only a normal primitive first stage, just as in *S. virginica*, except for the purely specific characters of less cornified smaller tubercles, etc.

Ctenucha virginica.

Tubercles well developed, setæ all single as in *C. auge*, but in addition subprimary vi is present on abdominal segments 1 to 8; no subprimaries on thorax.

This represents in the Euchromiid phylum the same stage reached by *H. cunea* in the Arctiid branch, but not quite fully as there is here no trace of the subprimaries on the thorax.

EXPLANATION OF PLATES VII AND VIII.

Fig. 1. Spilosoma virginica, stage I.
" 2. Spilosoma antigone, " "
" 3. Hyphantria cunea, " "
" 4. Halisidota maculata, " "
Fig. 5. Halisidota caryæ, Fig. I.
" 6. Cosmosoma auge, " "
" 7. Ctenucha virginica, " "

PRELIMINARY HAND-BOOK OF THE COLEOPTERA OF NORTHEASTERN AMERICA.

BY ROLAND HAYWARD.

(Continued from Vol. V, p. 40.)

The present part of the "Hand-Book," relating to *Bembidium*, has been prepared at the request of the Editor of this JOURNAL, made some time ago, but the fulfilment of which has been unavoidably delayed. It is, in fact, an abridgment of a larger paper on the species occurring in America, north of Mexico, which the author had in preparation at the time when the request was made, and which has only recently been published (Trans. Amer. Ent. Soc., 1897, xxiv, pp. 32–143). To this the student is referred for more complete descriptions, as well as for bibliography and synonymy.

In order to economize space, the species have not been arranged in groups, as has been done in the paper above cited, but are all included in one table. It will be observed that in all but two of our species (*lævigatum* and *semistriatum*) the dorsal punctures of the elytra are confined either to the third interval or to the third stria. In those just cited, however, they are arranged in irregular rows on all the intervals,